Some notes on the bionomics of Cirrospilus vittatus (Hym., Chalcidoidea), an important parasite of the apple-leaf miner, Stigmella malella (Lep., Stigmellidae)

by

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Though in the Netherlands *Cirrospilus vittatus* Wlk. may be reared from several species of leaf miners on apple trees, it seems that *Stigmella malella* (Stt.) is its main host on this food plant and that it is an important mortality factor of this leaf miner (EVENHUIS, 1965; EVELEENS & EVENHUIS, 1968). It was also commonly reared from *Stigmella subtrimaculella* Dufr. on poplar (*Populus nigra* L.), surrounding an apple orchard near Tiel, Province of Gelderland, where *Stigmella malella* occurred as an apple pest.

Adults of the parasite were able to live more than three months, both at a constant temperature of 20° C in the laboratory and at fluctuating temperatures in the field during the summer; in our laboratory trials the parasites had access to natural honey as a food. In the field a female *Cirrospilus vittatus* was once found feeding on the flowers of wild carrot *(Daucus carota* L.*)* near an apple orchard.

Female fertilized adult parasites, reared in the laboratory, were isolated in glass tubes containing honey smear and an apple leaf with one or more mines inhabited by *Stigmella malella*. If hungry, the female parasite may start to feed immediately on the honey. After a time of from 3 to 240 minutes, the female was attracted to the leaf. It walked over its surface, touching the cuticle with the bent flagellae of its antennae until it discovered a mine. With its antennae still bent and tapping the leaf, it followed the bends of the mine until it discovered the caterpillars at the distal end of the mine. If on following the bends of the mine, it finished up at the proximal end, the wasp reversed its course and soon discovered the caterpillar. This has been observed on several occasions.

Once it finds a living caterpillar, the wasp stands over it, straightens its prothoracic legs, thus raising its anterior and lowering its posterior end until the tip of its abdomen finds the exact point through which the ovipositor is to be inserted into the victim. This searching action occurs invariably every time before the ovipositor is thrust. Once the ovipositor is guided to the right point where it is to be inserted, the tip of the abdomen is raised to its normal, almost horizontal position. A succession of stinging actions follows at variable intervals, each separate act of stinging lasting about 50 to 60 seconds. Usually the stung caterpillar is paralysed. Now the female, with her ovipositor in the victim, starts to twist her abdomen left and right, thus enlarging the wound.

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This operation, too, may be repeated, usually at different depths after variable interruption periods. It results in the flow of the body fluid of the caterpillar to the surface of the leaf. Usually the female starts to feed on this fluid immediately, but sometimes it leaves its victim without feeding. During laboratory observations the host fed on one or on more caterpillars in close succession. The caterpillars thus treated by the wasp died and became shrivelled in their mines; no eggs were laid on or near them later.

In the few cases observed, the female parasite started to lay eggs about two to four days after beginning to feed on the host. Oviposition occurred either on the caterpillar or close to it in the mine. Eggs were found stuck near the neck of the caterpillar or on the sides of the body. The caterpillar is always killed, probably by the sting of the adult parasite.

Sometimes the eggs were stuck singly, and in other cases they were deposited in groups of two, three or even four. Once, an egg was found in the mine about 15 mm away from the caterpillar. Mostly, only one adult parasite emerged from one mine. Rarely two parasite larvae were observed on a single host caterpillar and both developed into adult parasites. The length of adult *Cirrospilus vittatus* varies from 0.8 to 1.8 mm; with the double parasitism, all the parasites that hatched were of medium size and were females.

Generally the size of the adult parasite is determined by the size of the caterpillar on which the larval stage of the parasite develops. EVENHUIS & EVELEENS (1968) reported that *Cirrospilus vittatus* is a parasite of older leaf miner larvae, but we have found that the wasp infests the younger smaller leaf miner larvae too, with mines about 19 mm long; the length of the mine of a full-grown caterpillar is about 47 mm. This may explain the large variability in the size of adult *Cirrospilus vittatus*.

Fully fed *Stigmella* caterpillars that had left the mines to pupate did not attract the female adult parasite; in fact the wasps were terrified of the caterpillars if they happened to approach them. But a full-grown caterpillar, still jacketed inside the mine, is readily attacked.

The incubation period of *Cirrospilus vittatus* eggs at room temperature of about 20° C is between four and six days. The larva feeds on the dead host and almost doubles its size in the first twenty-four hours after hatching. The length of the larval period in the same conditions averages five or six days, and the pupal stage lasts eight or nine days.

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